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FLOOD INSURANCE STUDY

CITY OF HASKELL, TEXAS

HASKELL COUNTY

SEPTEMBER 18, 1987

Federal Emergency Management Agency

COMMUNITY NUMBER - 480320

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NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
CITY OF HASKELL, HASKELL COUNTY, TEXAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Haskell, Haskell County, Texas, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the U. S. Army Corps of Engineers (COE), Fort Worth District, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-84-E-1506, Project Order No. 1, and amendments thereto. This work was completed in April 1986.

1.3 Coordination

On February 9, 1984, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the City of Haskell, and the COE (the study contractor). The meeting established flooding sources that would be studied by detailed methods, local floodplain regulations, available mapping, flood history, and other hydrologic data.

The following agencies and businesses were contacted for available data that could be contributed to the study: the U. S. Geological Survey (USGS), the U. S. Coast and Geodetic Survey (USC & GS), Greenhorne and

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O'Mara, Inc., the Soil Conservation Service (SCS), Dewberry and Davis, the Texas Water Development Board, and the Texas Department of Highways and Public Transportation.

On October 31, 1986, a final CCO meeting was held with representatives of FEMA, the city, and the study contractor to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Haskell, Haskell County, Texas. The area of study is shown on the Vicinity Map (Figure 1).

The following streams were studied by detailed methods: Rice Springs Branch, for its entire length within the community; and Stream RS-1, from its confluence with Rice Springs Branch to a point approximately 50 feet upstream of North Second Street. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction. The scope and methods of study were proposed to, and agreed upon by, FEMA and the City of Haskell.

2.2 Community Description

Haskell, the county seat of Haskell County, is in the center of the county approximately 50 miles north of Abilene, approximately 150 miles west of Fort Worth and approximately 90 miles southwest of Wichita Falls on the Burlington Northern Railroad. It is completely surrounded by the unincorporated areas of Haskell County. The population of the City of Haskell has fluctuated from 3,051 in 1940, 3,832 in 1950, 4,016 in 1960, 3,655 in 1970, to a 1980 census population of 3,782 (References 1, 2, and 3).

The City of Haskell was an early camping place of the Comanche, Kiowa, and Kickapoo as well as a watering place for buffalo hunters and gold seekers. Randolph B. Marcy's expedition in 1849 camped at the site known as Willow Springs. A member of the expedition wrote of the location in such terms that his brother, Thomas F. Tucker, migrated to the area in 1879 and built a pole shack, which was the first house. He named the settlement Rice Springs for Rice Durrett, an employee of Reynolds and Matthews Cattle Company. Tucker was elected first county judge when Haskell county was reorganized in 1885. Mrs. R. A. Standefer became the first postmistress, handling the mail, which was brought from Albany, in

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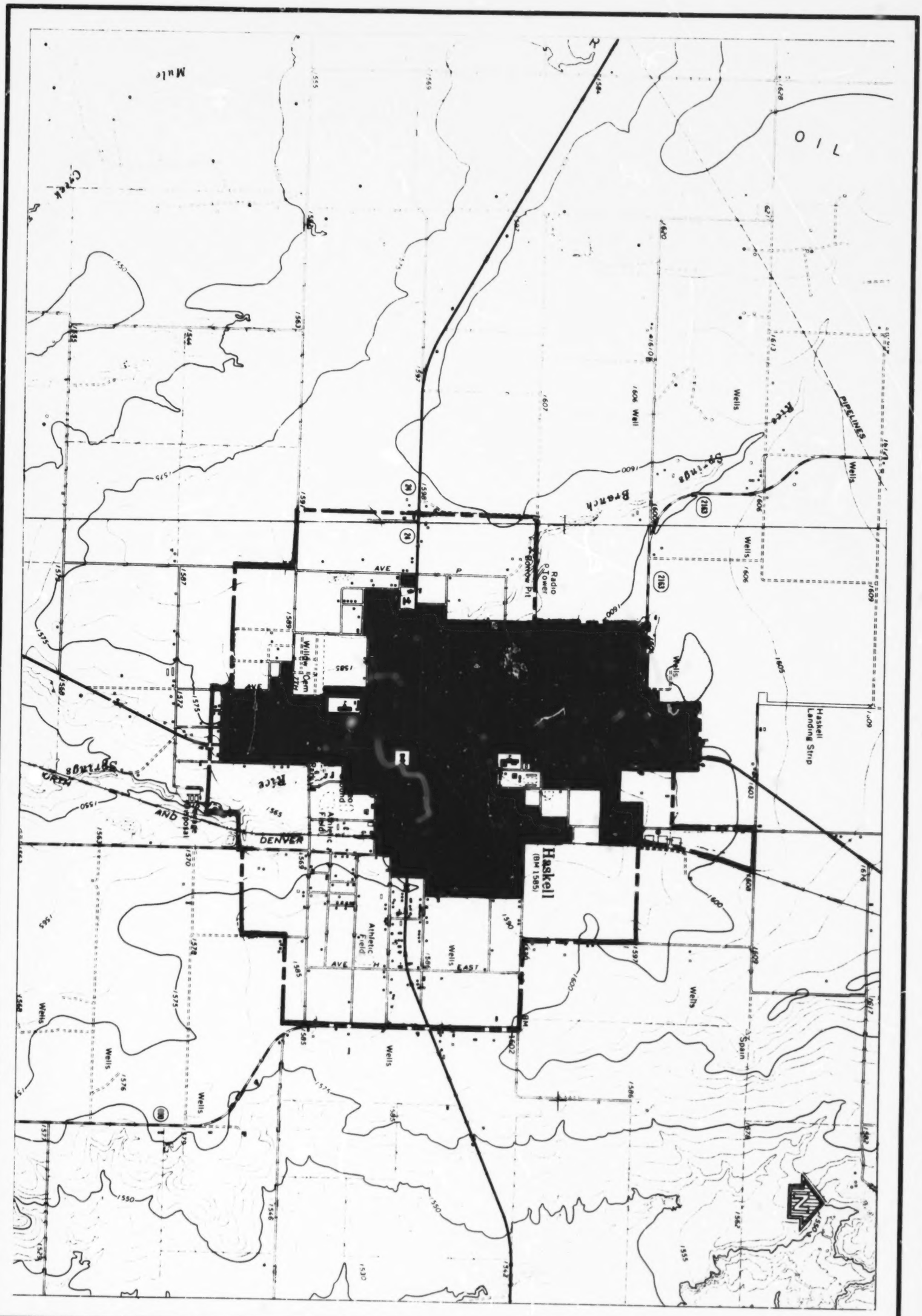
Haskell
(BM 1585)
DENVER
AND
SANTA FE
Haskell Landing Strip
Athletic Field
Wells
Spain
Radio Tower
Borrow Pit
PIPELINES
OIL
Mule
Creek
Branch
Rice
Spring
Wells
AVE
P
H
E
EAST
1606 Well
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1575
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her home. When a post office was established in 1885, the name of the settlement was changed to Haskell. A saloon known as the "Road to Ruin" was also used as a church (Reference 1).

Early industry of Haskell centered around the ranches of the area. Cotton and grain sorghums increased the industrial range to include gins, cottonseed oil mills, creameries, and canning plants (Reference 1).

Lake Stamford, 12 miles southeast of Haskell, was built by the town in 1952 to provide water for municipal and industrial use, as well as for boating, fishing and swimming.

Climatological data is available from the National Weather Service at the Abilene Municipal Airport. The rainfall pattern is typical of the region with the maximum in the spring during April, May, and June, and in the fall during September and October. A large part of the annual rainfall is the result of thunderstorm activity. The observed temperature extremes are 110 degrees Fahrenheit (°F) in July 1978 and -9°F in January 1947. The average annual rainfall for the period 1944 to 1983 is 23.98 inches. The lowest recorded annual rainfall occurred in 1956 with 9.78 inches, while the highest was 36.84 inches in 1969. There are no stream gaging stations within the study area of Haskell.

The terrain around the city, which is generally residential, is gently rolling with sandy loam, and gray and black soils. The terrain and is drained by tributaries of the Brazos River.

2.3 Principal Flood Problems

Generally, the major storms experienced in the vicinity are produced by heavy rainfall from frontal-type storms that occur in the spring and summer months. Major flooding can be produced by the intense rainfall usually associated with localized thunderstorms. These thunderstorms may occur at any time during the year but are more prevalent in the spring and summer months.

On August 3 and 4, 1978, as a result of Tropical Storm Amelia, approximately 18 inches of rain fell on the City of Haskell, severely damaging many area homes. This storm was greater than a 2 day 100-year frequency. Another flood in September 1980 with a 25-year frequency occurred when approximately 14 inches of rain fell.

2.4 Flood Protection Measures

Rice Springs Branch has been channelized from South Sixth Street to Avenue L with an earthen channel that contains less than a 10-year flood frequency. Floodplain development is regulated by ordinance.

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3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

For the streams studied by detailed methods, flow frequencies were developed using the computer program NUDALLAS (Reference 4). The watershed was divided into subbasins, and synthetic unit and flood hydrographs were developed at selected locations. National Weather Service Technical Paper No. 40, National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NWS Hydro-35, and the COE Civil Engineer Bulletin No. EM 1110-2-1411 were used in developing the 10-, 50-, and 100-year frequency storms (References 5, 6, and 7). The 500-year storm was based on extrapolated data. Peak discharge-frequency values were computed for selected locations. Routing of the flood hydrographs through each subbasin reach was accomplished using a modified PULS reservoir routing.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

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TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
RICE SPRINGS BRANCH					
Approximately 4,550 feet downstream of Burlington Northern Railroad	25.23	6,400	10,500	13,000	16,400
Approximately 1,100 feet upstream of confluence of Stream RS-1	20.47	6,000	9,600	11,750	14,750
Approximately 345 feet upstream of State Route 24	17.67	5,600	8,950	10,900	13,550
STREAM RS-1					
Approximately 370 feet upstream of confluence with Rice Springs Branch	2.99	1,960	3,010	3,500	4,200
Approximately 460 feet downstream of Burlington Northern Railroad	2.60	1,830	2,720	3,150	3,770
Approximately 140 feet downstream of Burlington Northern Railroad	0.53	530	770	880	1,020

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections for the streams studied by detailed methods were field surveyed and were located at close intervals above and/or below bridges and culverts in order to compute the significant backwater effects of these structures. Bridge datum were obtained by field measurements and by bridge plans from the Texas Department of Highways and Public Transportation.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

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Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 8). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations were based on slope/area computations.

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and floodplain areas. The following tabulation lists channel and overbank "n" values for the streams studied by detailed methods:

Stream	Channel	Overbank
Rice Springs Branch	0.040-0.070	0.065-0.085
Stream RS-1	0.055	0.070

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the streams studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 10 feet (Reference 9).

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The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zone AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 2). The computed floodways are shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. A portion of the floodway width for Rice Springs Branch extends beyond the corporate limits.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
						(FEET NGVD)		
Rice Springs Branch								
A	44,240[1]	485/370[2]	4,087	3.2	1,559.8	1,559.8	1,560.8	1.0
B	46,650[1]	300	2,171	5.4	1,566.5	1,566.5	1,567.3	0.8
C	47,825[1]	300	1,595	7.4	1,570.2	1,570.2	1,570.6	0.4
D	48,800[1]	351	2,332	5.0	1,574.7	1,574.7	1,575.4	0.7
E	49,850[1]	374	2,270	5.2	1,577.5	1,577.5	1,578.2	0.7
F	50,650[1]	475	2,648	4.4	1,581.3	1,581.3	1,581.5	0.2
G	52,000[1]	400	2,120	5.1	1,584.3	1,584.3	1,584.3	0.0
H	53,225[1]	350	2,549	4.3	1,586.7	1,586.7	1,587.3	0.6
I	54,710[1]	475/340[2]	3,454	3.2	1,590.9	1,590.9	1,591.9	1.0
Stream RS-1								
A	1,120[3]	130	876	4.0	1,562.9	1,562.9	1,563.6	0.7
B	2,120[3]	150	704	4.5	1,567.6	1,567.6	1,568.5	0.9
C	2,720[3]	125	289	3.0	1,570.5	1,570.5	1,571.3	0.8
D	3,660[3]	150	371	2.4	1,572.9	1,572.9	1,573.7	0.8
E	4,500[3]	150	329	2.7	1,577.2	1,577.2	1,577.9	0.7
F	4,850[3]	150	533	1.7	1,578.0	1,578.0	1,578.9	0.9

[1]Feet above confluence with Mule Creek
[2]Width/width within corporate limits
[3]Feet above confluence with Rice Springs Branch

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HASKELL, TX
(HASKELL CO.)

FLOODWAY DATA

RICE SPRINGS BRANCH - STREAM RS-1

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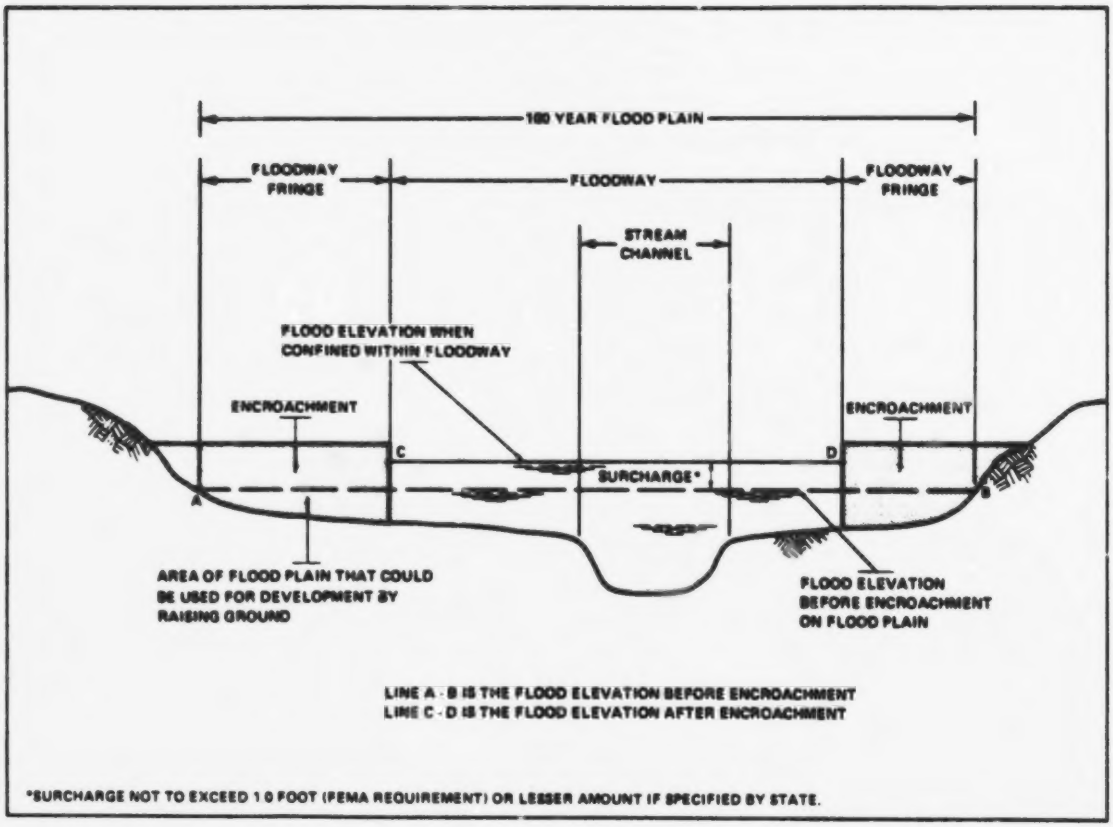
100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

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Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

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Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

7.0 OTHER STUDIES

A Flood Insurance Study has been published for the unincorporated areas of Haskell County (Reference 10). Due to the more detailed nature of this study, it will not be in exact agreement with the Flood Insurance Study for Haskell County.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Federal Regional Center, 800 North Loop 288, Denton, Texas 76201.

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9.0 BIBLIOGRAPHY AND REFERENCES

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2. The Texas State Historical Association, The Handbook of Texas, Volume 3, Texas, 1976.

3. The Dallas Morning News, The 1986-1987 Texas Almanac (Sesquicentennial Edition).

4. U. S. Army Corps of Engineers, Fort Worth District, Computer Program NUDALLAS, Fort Worth, Texas, revised September 1982.

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6. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Technical Memorandum NWS Hydro-35, Five to Sixty Minute Precipitation Frequency for the Eastern and Central United States, June 1977.

7. U. S. Army Corps of Engineers, Civil Engineer Bulletin No. EM 1110-2-1411, Standard Project Flood Determinations, March 1965.

8. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Users Manual, Davis, California, January 1981, with updates.

9. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Haskell, Texas, 1961, Photorevised 1979; Pinkerton, Texas, 1961, Photorevised 1979.

10. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas, Haskell County, Texas, Washington, D. C., October 15, 1976.

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EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	Elevation (Feet NGVD)	Description of Location
RM 1	1,585.44	USC & GS brass cap stamped 1934-E-280, at Haskell County Courthouse located on north side at east entrance steps on top of stone ledge.
RM 2	1,602.33	USC & GS brass cap stamped 1934-g-280, at northwest corner of intersection of North 8th Street and State Route 500, 2,000 feet north of State Route 24 (North 1st Street).
RM 3	1,568.64	Railroad spike set in power pole at southwest corner of Avenue D and South 9th Street.
RM 4	1,559.88	Chiseled square in northwest corner of north headwall, 420 feet east of Avenue D and 12 feet north of centerline of South 6th Street over Rice Springs Branch.
RM 5	1,563.03	Chiseled square in east end of north headwall approximately 175 feet west of Burlington Northern Railroad, formerly named Wichita Valley Railroad, along South 6th Street over Stream RS-1.
RM 6	1,576.40	Chiseled square on top of curb 38 feet south of North 1st Street (State Route 24) and 22 feet west of Avenue H, 26 feet north of north headwall on Avenue H over Rice Springs Branch.
RM 7	1,588.98	Bridge spike in intersection of Avenue L and North 7th Street.
RM 8	1,577.63	Chiseled square on east end of north headwall of State Route 24 over Stream RS-1.

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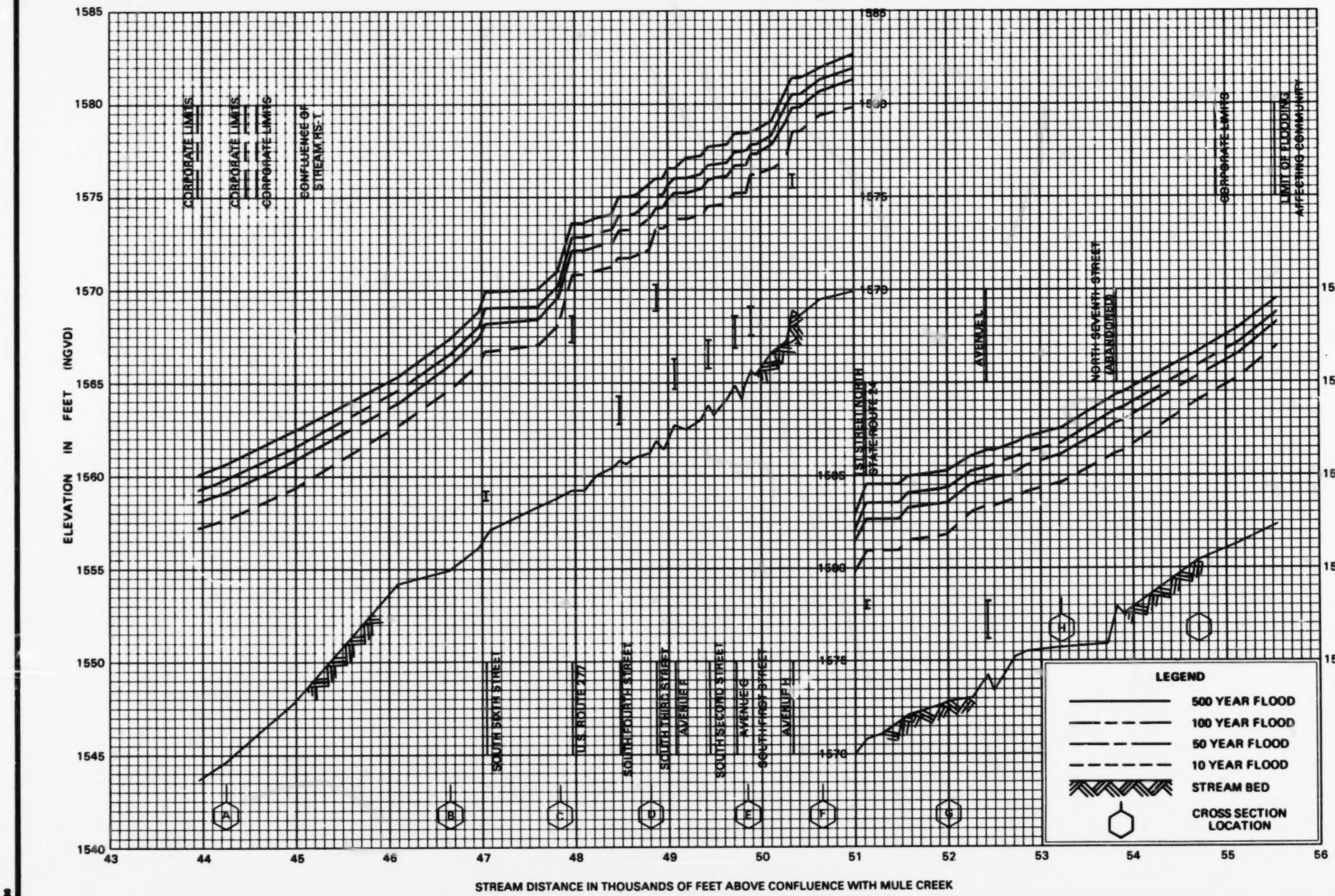

FLOOD PROFILES

RICE SPRINGS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HASKELL, TX
(HASKELL CO.)

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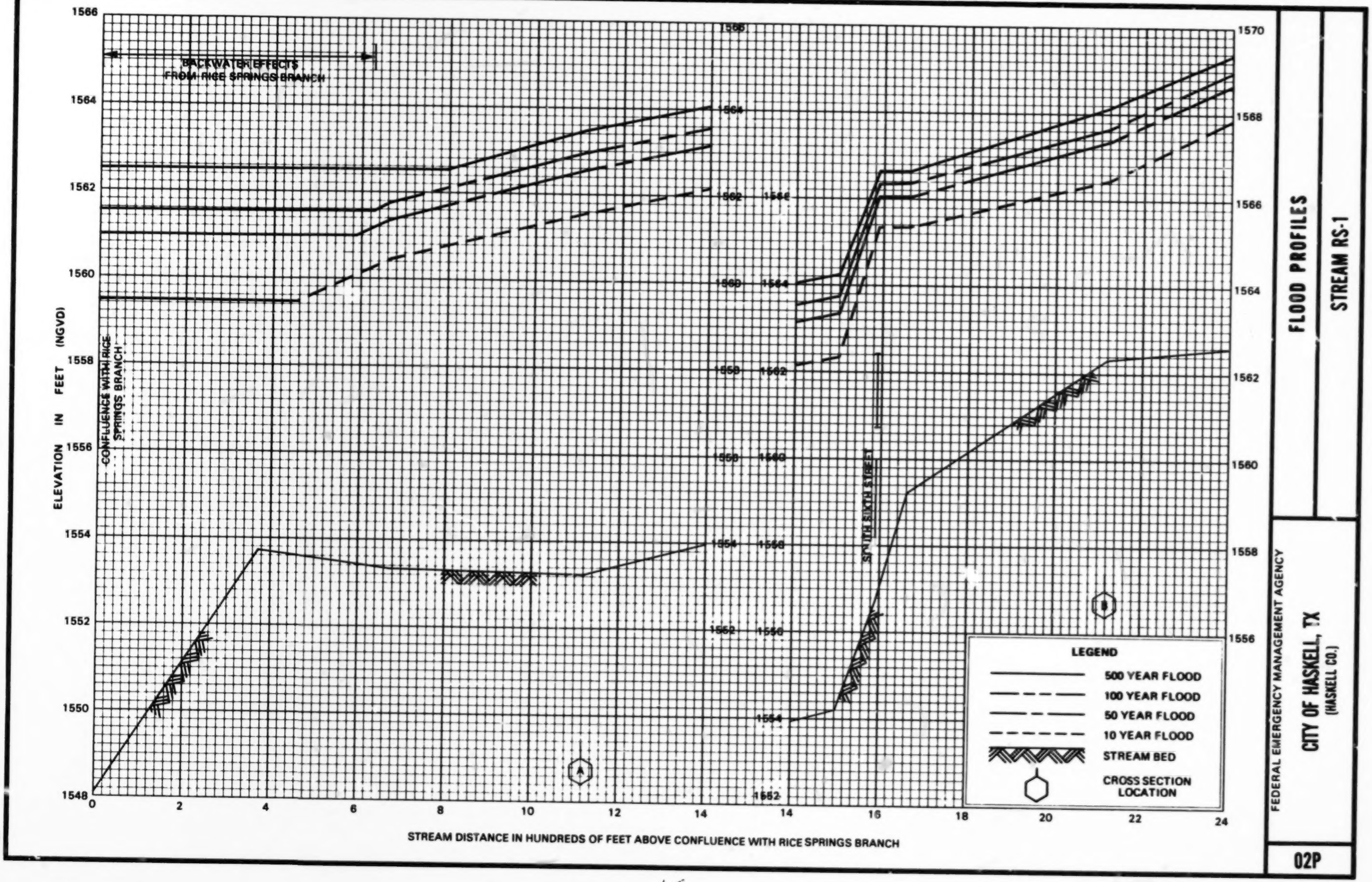

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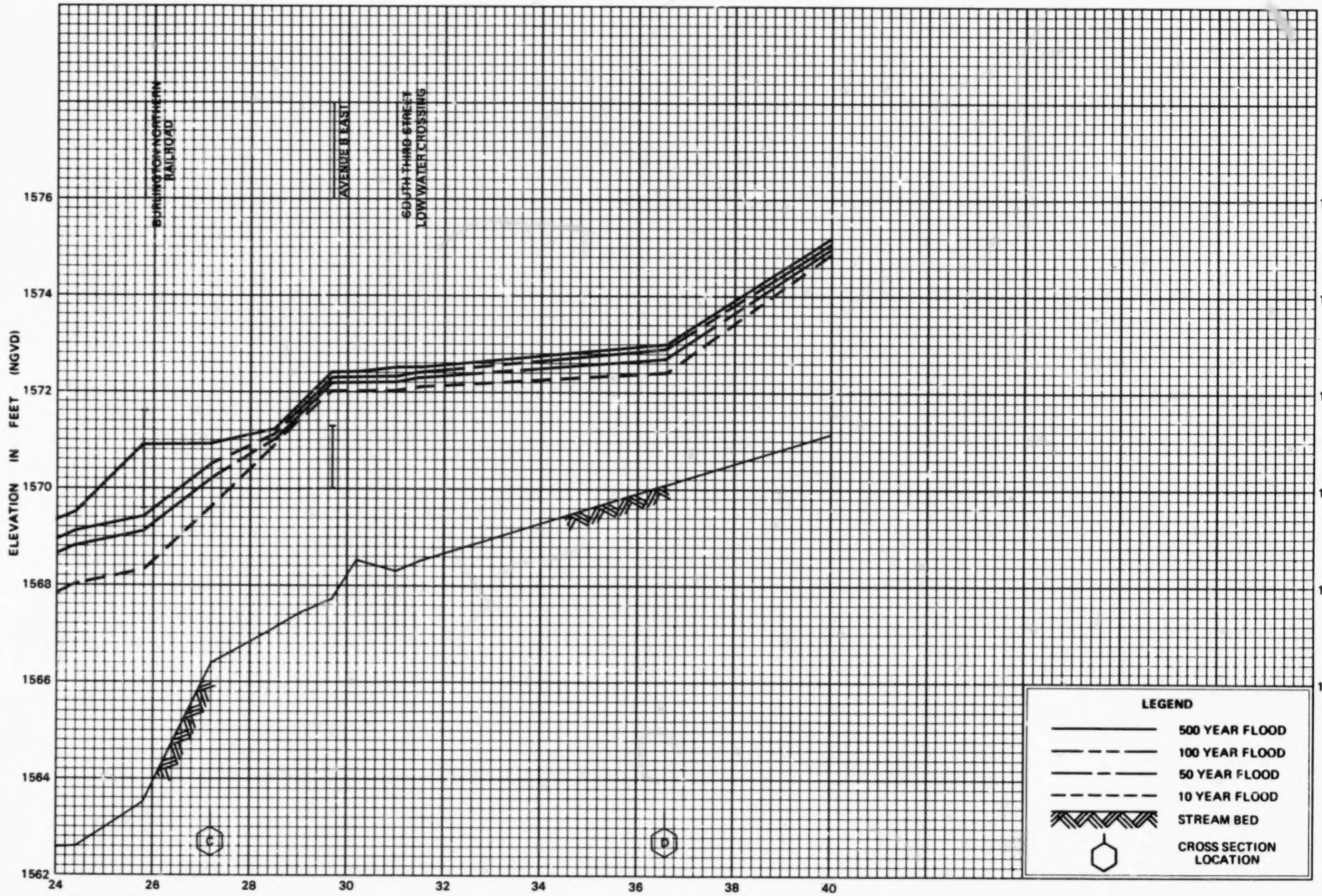

FLOOD PROFILES

STREAM RS-1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HASKELL, TX
(HASKELL CO.)

03P

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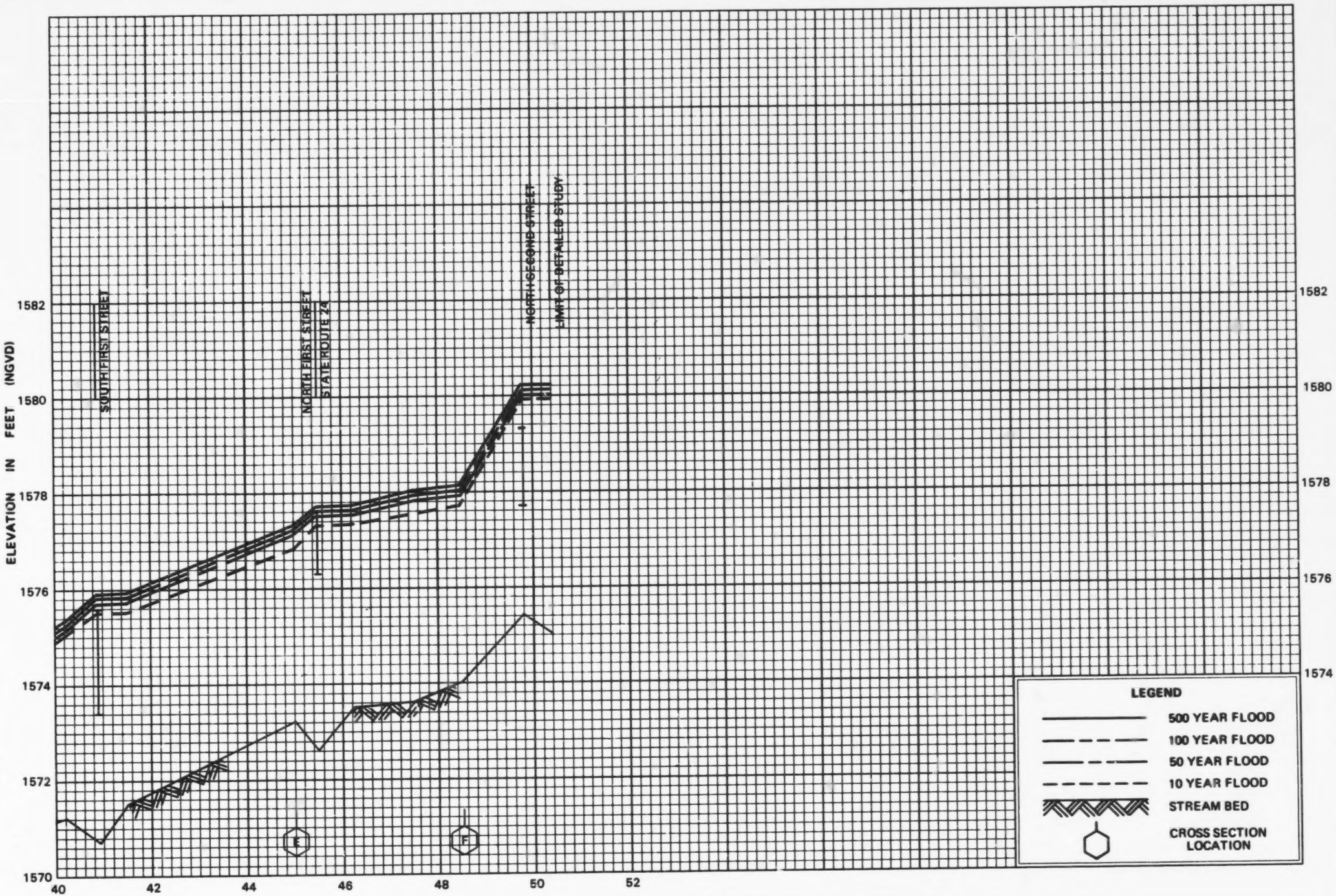

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